

APPLICATION NOTE

VEGA-GC

Workers Health & Safety

CONTINUOUS MONITORING ANAESTHETIC GASES IN OPERATING THEATRES



Nitrous Oxide (N₂O) and Halogenated Anaesthetics (HAs) like Sevoflurane, Isoflurane and Desflurane are widely used in operating theatres. Both gases are connected to the breathing apparatus that keeps the patient sedated: N₂O is provided in its gaseous form by a distribution net throughout the Hospital, while the HAs are highly volatile liquids, put in the anaesthetic machine where they vaporize and mix with the air sent to the patient.

Through years, N₂O is being replaced by HAs. Neonatal Intensive Care Units (NICUs) use Nitric Oxide (NO) instead, supplied by a portable generator connected to the breathing machine.

CUSTOMER:

Department of Toxicology and Preventive Medicine of San Martino University Hospital, directed by Dott. Luigi Baccelliere, is one of the most important in Italy and a research center of international relevance.

ANAESTHETIC GASES AND NITRIC OXIDE TOXICITY:

Anaesthetic gases pose a well known threat to the health of the operating crew : in vivo tests and interviews to exposed personnel showed...

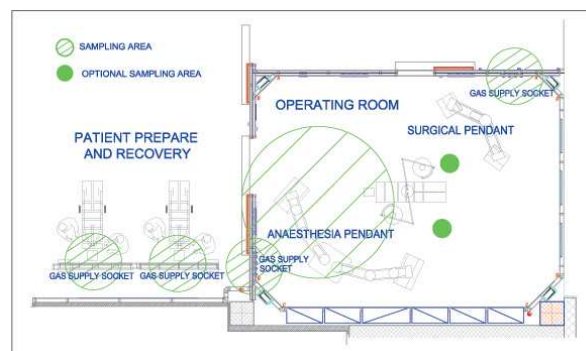
Nitric Oxide, more tolerable to the young patients who inhale it a few times in their life, is still dangerous for the chronically exposed crew: anoxia, skin and eye irritation, cyanosis. (TLV-TWA for N₂O is 50.0 ppm, TLV-Ceiling for HAs is around 2.0 ppm, TLV-TWA for NO is 25.0 ppm)

SAMPLING:

Operating Theatres are active almost 12 hours a day, and some of them are kept ready all night to support the Emergency Room, therefore a continuous, automatic monitoring is required.

The main contamination sources are: anaesthetic machine, usually on a pendant next to the head of the patient walls of the operating room, where N₂O supply sockets are usually built walls of the Preparation and Recovery rooms, where N₂O supply sockets can also be found.

The NICU works 24 hours a day, so the continuous monitoring is even more important, next to the anaesthetic machine (to which the portable generator is connected) and to the patient Vega-GC can sequentially analyze all these areas, bringing it from one point to another or connecting it to a Vega-MPS multipoint sampler, which can send to the GC air samples taken from all points at once.

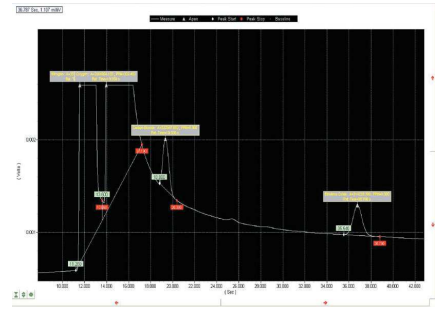


ANALYSIS:

Vega-GC detects N₂O, HAs and NO in less than 2 minutes, separating them from each other and from interfering components: the detection limit is around 0.2 ppm for HAs, 0.5 ppm for N₂O, 3.0 ppm for NO.

DATA PROCESSING:

The colour touch-screen of Vega-GC shows, for each gas, all measured concentration values and their average, calculated on the length of a work shift. All data are saved with date and time of sampling, and can be printed or sent to a USB key: there is no need for post-processing in a lab, the operator just downloads the data and write down the report.



DATA PROCESSING:

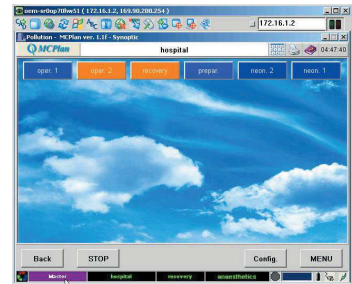
MC-Plan software controls both GC and MPS, performing a completely automatic monitoring 8 hours a day from Monday to Friday. The site manager sees on his PC a synoptic view of the facility, with a box for each sampling point. The software calculates the average value for each point and, if it exceeds 1.0 ppm, the corresponding box turns red and an acoustic alarm sounds. By clicking on the box, it is possible to see all data and graphically visualize their trend in time. All analytical results are stored in a database, locked by a password known only to the OHS office.

RESULTS:

Vega-GC has been extensively tested in operating rooms, but only few measurements have been made in the NICU, so few data are available for NO. The concentration of Sevoflurane in the Operating Rooms was sometimes very high, due to an improper use of the vaporizer (otherwise it would be detected continuously) while N₂O was always under the TLV, the misconnection of the breathing machine to the wall sockets being very rare.

CONCLUSION:

Vega-GC can detect all Anaesthetic gases with high selectivity, which means no interferences, and enough sensitivity to guarantee that their concentrations are under their TLV.



Analytical parameters

- **Analyzer:** Vega-GC, double column, portable version
- **Column:** PoraPlot-Q 10m length and CP-Sil 5CB 8m length, both 0.15mm internal diameter.
- **Injector:** standard
- **Pressure:** 100 kPa, both columns
- **Temperature:** 40°C, both columns
- **Run Time:** 60s

SINCERT POLLUTION S.r.l.



Via Guizzardi, 52 - 40054 Budrio (BO)
tel. +39 051 6931.840
fax +39 051 6931.818
pollution@pollution.it
P.I. 00694631201 - C.F.04051900373

www.pollution.it

POLLUTION
a People Firm